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U. S. DEPARTMENT OF AGRICULTURE

the White-Fringed Beetle

How to Control It with Insecticides
How to Prevent Its Spread

Leaflet No. 401

the White-Fringed Beetle

How to Control It with Insecticides
How to Prevent Its Spread

The white-fringed beetle [1] seriously damages field and garden crops and ornamental plants. It will feed on almost any kind of plant—from wild asters, blackberries, and cockleburs to peanuts, cotton, potatoes, tobacco, and corn.

The larvae, or grubs, do most of the damage. They live in the soil and feed on the roots of the plants. (Adult beetles feed on the foliage but cause little damage.) Affected plants usually turn yellow, wilt, and die. Those that survive seldom develop normally.

The application of insecticides can prevent crop damage. If they are applied soon after an infestation is located, spread of the insect is prevented.

Before the development of effective control measures, the beetles caused widespread damage. Farmers near Florala, Ala., were hard hit in 1936, 1937, and 1938. Damage was so severe in 1938 that 1,500 acres of cropland were left unplanted.

Crop damage still occurs, but it is limited to infested lands that haven't been treated properly for the control of the white-fringed beetle.

ORIGIN AND SPREAD

It is not known how and when the insect established itself in the United States, but the beetles were first found in a peanut field in Okaloosa County, Fla., in 1936. Since then, they have been located in seven other Southeastern States —Alabama, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee—and in New Jersey.

Entomologists believe that the white-fringed beetle could survive in a latitude somewhat north of Philadelphia, extending to southern Iowa, which would include large areas of the Corn Belt. Records of the insect in South America indicate that it could become established in irrigated sections, such as those in Western United States.

White-fringed beetles cannot move any great distance on their own. The larvae are legless, and move only a few feet in the soil while they are feeding. The adults cannot fly but may crawl up to one-fourth mile during their lifetimes.

How do the beetles spread? They are transported to new areas principally in commerce. Adults may attach themselves to seed cotton, hay, agricultural implements, or even to man. Larvae may be spread by the movement of soil, sod, nursery stock, and root crops, such as potatoes. Hay harvested from infested fields in late summer and fall may contain viable eggs.

The beetles are natives of Argentina, Brazil, Chile, and Uruguay. Infestations have also been reported in New South Wales, Australia, and in the Union of South Africa.

[1] *Graphognathus* spp.

DAMAGE

White-fringed beetles do not usually cause uniform damage over large continuous areas. Crop injury may range from just a trace in one part of a field to destruction of a crop in a nearby field.

In general, plants with main roots (tap roots) are damaged more severely than those with fibrous roots. The larvae may sever the main root while they are feeding. On root crops, such as potatoes, carrots, and turnips, they burrow directly into the roots, and destroy the market value of the crop.

A number of factors may influence the intensity of an infestation. The beetles are more abundant—and damage is greater—in well-drained, sandy loam than in heavy clay soils. An unusually dry summer may retard the beetle's development. A heavy rainfall, which saturates the soil for about a week, kills many young larvae.

DEVELOPMENT

The white-fringed beetle passes through the following stages: Adult, egg, larva, and pupa. It usually produces only 1 generation a year, and spends all but about 3 months in the soil.

Adults begin emerging from the soil in early May and continue to do so until early fall, the exact time of emergence depending on the locality. They are dark gray, are about $\frac{7}{16}$ inch long, and have a white fringe, or band, along the outer edges of the body. They feed on margins of leaves for several days and then begin laying their eggs. (All adults are females and are capable of laying fertile eggs.)

The eggs are laid in masses on sticks, and other debris lying on the soil; on stems of plants; or in the soil, usually near the roots of a plant. They are covered with a sticky substance that holds them together and also to the object on which they are deposited.

An egg mass usually contains 11 to 14 eggs, but some masses have up to 60 eggs. Each egg is about $\frac{1}{25}$ inch long.

How many eggs an adult lays and how fast she lays them depend upon the kind of plant on which she feeds. In tests conducted by entomologists at Florala, Ala., beetles that fed on peanut foliage laid an average of 1600 eggs (one beetle laid 3,258 eggs), but those that fed on grasses

Larval damage to cotton field

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laid an average of only 4 eggs. Legumes and broad-leaved plants, such as cocklebur, ragweed, peanuts, soybeans, and strawberries, induce heavy egg laying; while cowpeas, blackberry, lespedeza, Mexican clover, pecan, and tobacco have the opposite effect.

Adults live 2 to 5 months, and lay eggs much of that time in the presence of favored foods.

The right combination of temperature and moisture is required for the eggs to hatch. Eggs laid during the summer usually hatch in about 17 days. But those laid during the fall and winter require longer periods—sometimes as much as 100 days. Some eggs may remain viable throughout the winter and hatch the following spring.

The larvae are yellowish-white grubs that are up to ½ inch long. They enter the soil and feed almost constantly. As they grow, they molt, or shed their skins, several times. It usually takes about 11 months for the larvae to develop, but under certain conditions some larvae require 2 years or more.

Normally, these insects pass the winter as larvae in the soil, but they may overwinter as eggs. In the spring and summer, the larvae construct cells 2 to 6 inches below the soil surface where they transform into pupae. In about 13 days, the adults emerge.

CONTROL

You can control the white-fringed beetle by applying an insecticide. Good farm practices are necessary to produce satisfactory crop yields.

The best method of controlling these insects is to kill the larvae with an insecticide. A single application to the soil remains effective for several years.

Aldrin, chlordane, DDT, dieldrin, and heptachlor will provide effective control when used as indicated. These insecticides are available in one of the following forms: Emulsifiable concentrate or wettable powder, from which sprays can be prepared; granule; or dust.

Sprays, dusts, or granules may be applied by power or hand equipment, or by airplane. Consult your nearest white-fringed beetle inspector or your county agricultural agent for information on the best method of application.

Cultivated Land

To control the beetles on field or truck crops, in gardens and in orchards, broadcast aldrin, chlordane, DDT, dieldrin, or heptachlor on the soil when preparing it for planting. Immediately after application,

Partial List of Plant Hosts of the White-Fringed Beetle

Alfalfa
Beet
Beggarweed
Bell pepper
Bitterweed
Blackberry
Buttonweed
Cabbage
Careless weed
Carrot
Celery
Chrysanthemum
Citrus
Clover
Cocklebur
Corn
Cotton
Cowpea
Crabgrass
Dahlia
Daisy
Dandelion
Dewberry
Dock
Dogfennel
Dollar-weed
Eggplant
False-indigo
Hickory
Hoary pea
Honeysuckle
Horsenettle
Horseweed
Iris and other rhizomes
Kudzu
Lespedeza
Lily and other bulbs
Lima beans
Maypop
Marigold
Melons
Mexican clover
Morning glory
Muscadine
Oat
Okra
Paspalum
Peanut
Pecan
Persimmon
Pigweed
Pinkweed
Pokeberry
Potato
Radish
Ragweed
Red gum
Sicklepod
Smartweed
Sorrel
Soybean
Strawberry
String bean
Sunflower
Sweetpotato
Tea-weed
Tobacco
Tomato
Turnip
Velvetbean
Verbena
Violet
Wheat
Zinnia

WHITE-FRINGED BEETLE

A, *a*, Strawberry plant injured by white-fringed beetles; *b*, adult beetle. *B*, Larval injury to alfalfa root system; *a*, female ovipositing under ground litter; *b*, egg mass; *c*, pupa; *d*, full-grown larva; *e* and *f*, immature larvae. (*A* and *B*, natural size.) *C*, Adult beetle (four times natural size)

work the insecticide thoroughly into the upper 3 inches of the soil. See table below for rate of application and for crops for which approved.

An alternative treatment is to apply one of the recommended insecticides, alone or mixed with fertilizer, in the drill row at the time of planting. Row treatments give crop protection, but are not as effective in reducing the overall beetle population the first year as are broadcast treatments. See table below for rate of application.

Noncultivated Land

Noncultivated land, such as lawns, industrial and railroad properties, roadsides, and wastelands, that are not used for grazing animals can be treated with a surface application of DDT or dieldrin. Surface applications require heavier dosages than soil applications.

For best results, apply the insecticide only during the winter and early spring. See the table below for the rate of application.

Pasture and Forage Crops

For treatment of hay crops, pastures, and established stands of forage legumes, consult white-fringed beetle program personnel.

INSECTICIDES TO CONTROL THE WHITE-FRINGED BEETLE

Type of land	Insecticide	Type of application			
		Broadcast		Drill row [1]	
		Pounds per acre	Years effective	Pounds per acre	Years effective
Cultivated (soil treatment)	Aldrin [2]	3	3	¾ to 1½	1
	Chlordane	5	3	1 to 2	1
	DDT	10	4	2 to 3	1
	Dieldrin	1½	4 or more	½ to ¾	1
	Heptachlor [3]	3	3	¾ to 1½	1
Noncultivated (surface treatment)	DDT [4]	25	4 or more		
	Dieldrin [4]	3 to 5	4 or more		

[1] Deposit below depth of seed. If the distance between drills is less than 3½ feet, apply the maximum dosage; if it is more than 3½ feet, apply the minimum dosage.

[2] Aldrin is approved for soil treatments for only the following crops: Beans, carrots, cabbage, corn, cotton, Irish potatoes, peanuts, small grain, sugar beets, sugarcane, sweetpotatoes, tobacco, and tomatoes.

[3] Heptachlor is approved for soil treatments for only the following crops: Beans, cabbage, corn, cotton, Irish potatoes, onions, peanuts, small grain, strawberries, sugar beets, sugarcane, sweetpotatoes, tobacco, and turnips.

[4] Application should be made only under the general direction of qualified Federal or State white-fringed beetle personnel.

PREVENTION

The white-fringed beetle is a potential threat to many agricultural areas of the United States. That is why it is important for individual growers to be able to locate an infestation before it becomes widespread—and to do something about it: and why all known infested areas are now under Federal or State quarantine.

Quarantines

The primary purpose of the quarantines is to prevent the spread of the white-fringed beetle by regulating the movement of articles that may carry infestations. The work is carried on in several ways:

1. Regulatory officials in quarantined areas certify certain plants, crops, implements, soil, forest products, and other articles before they can be shipped into non-infested areas of this country. To be eligible for certification, the article must be produced, handled, processed, or treated in such a way as to be free of white-fringed beetles. An approved insecticidal soil treatment that is used as a basis for certification of plants in soil will free nursery lands of white-fringed beetles.

2. Insecticides are applied, or other preventive measures are taken, at production and shipping points to prevent infestation of products. In addition, insecticides are used by individuals, industries, and communities to treat fields, railroad yards and sidings, storage areas, nurseries, and roadways. The treatment of these areas, done under the leadership of Federal and State officials, lessens the chance of accidental and natural spread of the beetles.

How You Can Help

Every plant grower—farmer, vegetable and flower gardener, homeowner, nurseryman—can assist Federal and State pest control agencies by locating white-fringed beetle infestations and reporting them promptly.

Read "How To Look for the White-Fringed Beetle," below. This will help you to locate an infestation. If you find adults and larvae that resemble those in the colored drawings on page 5, place them in a small bottle of 70 percent alcohol and send to your county agricultural agent, nearest white-fringed beetle inspector, or State entomologist.

When sending specimens, include your name and address, and tell where and when the insects were found. *Do not send live insects through the mail.*

HOW TO LOOK FOR THE WHITE-FRINGED BEETLE

You can determine whether the white-fringed beetle is present by looking for the larvae and adults.

Look for Larvae

1. Look for larvae, or grubs, in soil around the roots of plants, particularly plants that are wilting or dying.

2. Inspect young plants, particularly seedlings, during the spring months in farm fields, vegetable gardens, and flower beds, for abnormal symptoms, such as wilting, reddening, and yellowing. Examine the soil where skips occur in the rows of plants.

3. Dig out abnormal plants by the roots and break the soil apart. Look for larvae on the roots, and also in soil. It is often necessary to examine the roots and soil of

Working insecticide into soil

several wilting or yellowing plants before finding larvae.

Look for Adults

1. Examine the outer edges of the leaves for sawtooth cuts; adults do not make holes in the leaves. (See colored drawing on p. 5 for leaf damaged by adults.)

2. Inspect cultivated crops, such as soybeans, velvetbeans, peanuts, cotton, and clover to see if the outer edges of the leaves show insect damage.

3. Look for adults on broad-leaf weeds growing in the fields, along the terraces, turn rows, or fence lines. (Where both small grains and weeds are found in the field the adults will feed on the weeds.)

4. Look around the base of the plant, under leaves, or in grass if you don't find adults on the leaves.

PRECAUTIONS

The insecticides recommended for white-fringed beetle control are poisonous. In handling insecticides, follow directions and heed the precautions given on the labels.

Do not let insecticides get on the skin or in the eyes; use a respirator if necessary.

Do not use insecticides when the wind is strong.

To protect fish and wildlife, do not contaminate streams, lakes, or ponds with the insecticides.

Keep shirt sleeves down and shirt collar buttoned.

Bathe and change clothes as soon as the spraying or dusting job is finished.

The white-fringed beetle can be mistaken for other insects. The natural-color illustration on p. 5 will help you to distinguish it from similar looking beetles.

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